On the wings of imagination": Agnes Giberne and women as the storytellers of victorian astronomy

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Title of Paper: **"ON THE WINGS OF IMAGINATION": AGNES GIBERNE AND WOMEN AS THE STORYTELLERS OF VICTORIAN ASTRONOMY**
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Abstract:
Agnes Giberne was a "pioneer" of easy to understand astronomy books for children and beginners. She merged fact with fiction to educate her readers about the wonders of the heavens and the religious significance she believed resided there. Employing the dialogue form and the theme of the cosmic journey she encouraged her readers to learn about the sun, moon and planets on "the wings of imagination". Victorian astronomy was predominantly a male science and astronomical writing operated as chiefly a male genre. Yet, Giberne carved out a place as one of the most popular writers on astronomy in the late nineteenth century, her works appealing across generational, gender and class lines. Giberne's astronomical writing was shaped by contemporary critical responses to women's place in astronomical science and the genres acceptable for female authorship. Writing for children, using analogies from botany and being "mindful" of her "catechism", Giberne stayed within the bounds of Victorian femininity. However, Giberne used her writing on astronomy, not only as an acceptable feminine vehicle for transmitting the facts of astronomical science, but also to show how women, as well as men, could be the storytellers of astronomy.

Keywords: Agnes Giberne, astronomy, nebular hypothesis, telescope, children's literature, women's writing, nineteenth century, Victorian, conversational / dialogue form, cosmic journey.

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In 1868 the essayist Anne Mozley summed-up Victorian attitudes to "Clever women": "Knowing too much and thinking too much are alike fatal to charm" ("Clever" 412). Mozley expressed the need for women writers to remain within the bounds of Victorian femininity and to be "mindful of their catechism" ("Clever" 427). One of the most successful female authors of the second half of the nineteenth century was Agnes Giberne. "Mindful" of her "Catechism" and Victorian standards of femininity, Giberne was a prolific author of books for children and adults. She published over 100 didactic novels and scientific books with moral and evangelistic religious themes. Her scientific books ranged across the sciences of geology, meteorology, oceanography, botany and astronomy. Giberne was most famous for her books on astronomy, and in particular for her *Sun, Moon, and Stars* (1880) and its sequel for younger children *Among the Stars* (1885). She also published articles on astronomical subjects in popular periodicals. From April to October 1893, she contributed a series of monthly articles titled ''Sun-rays and Star-beams", to the Oxford Movement's magazine *The Monthly Packet of Evening Readings for Members of the English Church*. Likewise, in April 1896 Giberne published an article in *Chambers's Journal* called "The Far Distances of Our Universe", where she "picture[s] … the vast extent of the starry system, in which we reside" for the "inquiring mind" (213).

Giberne was an imaginative writer whose astronomy books were part of the historical literary tradition of story-telling to educate children and beginners. Her astronomy books and articles are full of easy to understand lessons about the universe including its development, the distances of the stars and planets, and the nature of comets and eclipses. These lessons are infused with the sense of wonder and the appreciation of beauty that could come from watching the heavens, and the religious significance Giberne found there. Reviewers celebrated her astronomical works; the scientific journal *Nature* reviewed all the astronomy books she published from 1893 to 1921. Yet, there has been little sustained critical attention paid to her astronomy books and their important role in Victorian scientific culture. Apart from Bernard Lightman's informative section in his *Victorian Popularizers of Science* (2007) in which he examines the *corpus* of her scientific books, Giberne's writings receive scant attention today.[1] Redressing this oversight, this article establishes her as "a pioneer" of easy to understand astronomy books for children and beginners, and shows how Giberne's astronomical writing was shaped by contemporary critical responses to women's place in science and the scientific genres acceptable for female authorship.This essay is situated at the intersection of science, literature and gender. Leading works in the history of science and gender by Ann B. Shteir, Barbara T. Gates and Suzanne Le-May Sheffield, have recognized the limitations on women's place in Victorian science. However, they have also emphazised the agency of female authors in becoming public science writers. By examining in depth Giberne's place in astronomy and the manner in which she disseminates knowledge of the science, my research extends their thesis from women naturalists to women astronomers.This

article has also been informed by the interest in the popularization of science through popular print in the Victorian period by those such as Lightman, Jonathan R. Topham and Aileen Fyfe.This essay contends that Agnes Giberne's career as an educator of astronomy, was shaped by the difficulties that arose for Victorian women scientific writers within the male dominated astronomical community, and through wider societal attitudes to femininity. Giberne, I argue, negotiated these obstacles and made a huge contribution to Victorian astronomy through popular print, whilst remaining within the bounds of Victorian ideal womanhood. Rather than seeing Giberne as succumbing as a victim of patriachial attitudes to women in science, my research reveals how she used her astronomy books as a platform to show how women, as well as men, could fulfil a public role as the storytellers of astronomical science.

"A pioneer"

Giberne was an amateur astronomer who served on the setting-up committee of the British Astronomical Association (BAA) becoming a founding member in 1890.[2] She was well respected by many of the important astronomers of her day. Her Victorian contemporaries could not praise her enough as an educator of the science. Her *Sun, Moon, and Stars* which sold for five shillings and was in its eleventh print run of 1,000 copies by 1885, was introduced by Oxford Savilian Professor of Astronomy Sir Charles Pritchard (*Among* 311). He commended it as telling "the tale of the Stellar Universe" with "great simplicity, and perhaps with sufficient completeness; in an earnest and pleasant style, equally free, I think, from any considerable inaccuracy, or any unpardonable exaggeration" (vi). In the introduction to her *This Wonderful Universe* (1920), the rewrite of her 1897 edition for the Society for the Promotion of Christian Knowledge, she acknowledged the help of eminent astronomers such as E.Walter Maunder, Fellow of the Royal Astronomical Society and H. H. Turner, Director of the Observatory of the University of Oxford. Her obituary in *The Times* newspaper described her as most famous for her books on astronomy for beginners, and as a "pioneer" of "easy and popularly written books on scientific subjects" ("Miss" 12). Such was her standing as an author on astronomy that Margaret Huggins, wife and co-worker of the astronomer Sir William Huggins, who like Giberne was also a founder member of the BAA, described in her preface to Giberne's *Radiant Suns* (1895) how children and general readers owed much to Giberne's astronomy books. "It may well be", she wrote, "that some Newton or Herschel of the future may in old age point to these books, and say, 'These first awoke my longing to be an astronomer!'" (iv-v). Indeed, this prediction came true; Giberne's astronomy books had a determining influence on eminent astronomers such as Hector Macpherson, Fellow of the Royal Astronomical Society and author of many books on astronomy. The first books on astronomy Macpherson read were Giberne's *Sun, Moon, and Stars* and her *Among the Stars* which his father borrowed from a library for him to read (*Year Book* 29). Hector published his first paper titled "Is Mars Inhabited?" in the *North British Advertiser* aged just fourteen, and referred to Giberne in his later books

on astronomy ("Obituary" 255). In his *Through the Depths of Space* (1908), Macpherson found "a vivid idea of the scale of magnitude on which the Universe is built is given by Miss Giberne in her statement that if the distance of the Sun to Neptune was reduced to ten feet, fourteen miles would separate our system from the nearest of the stars" (85-86).[3]

Giberne's astronomy books often appeared in recommended reading lists for children. In its 1892 advisory article "What shall school girls read?" the *Review of Reviews* listed Giberne's *Sun, Moon, and Stars* alongside the famous Victorian astronomer Sir Robert Stawell Ball's *The Story of the Heavens* (1885), as important educational reading for older girls to prevent "a life of excitement" and "distaste for anything serious" fostered by the "habit" of reading "storybooks" (159). However, Giberne planned a wider audience for her *Sun, Moon, and Stars* than just children. In her introduction she described her intention that the book would prove educational to beginners in astronomy "whether children, working-men, or even grown people of the educated classes" (xi). Astronomy, Giberne realised permeated all levels of society and was practised in observatories, schools and homes. Men, women and children were fascinated by the latest facts being revealed by the science and its new technologies, such as the spectroscope, astronomical photography and the huge telescopes being built all over the country. Neither was the interest in the science divided by class. Although the possession of large professional telescopes demanded wealth, those of lower income could marvel at the heavens through the telescopes of street exhibitors, follow Jabez Hogg's instructions to build their own telescopes from paper and tin tubing, enjoy shows of orrery, or attend public lectures offered by local astronomical societies or organisations such as the Young Men's Christian Association (Hogg 348-49). Likewise, in the home they could marvel at James Nasmyth's heliotypes and woodburytypes of the surface of the moon in his and James Carpenter's *The Moon Considered as a Planet, a World, and a Satellite* (1874), and learn the constellations by using a diorama umbrella that could fabricate the stars on the lit parlour ceiling (Fig. 1).[4]

Although the increase in the number of schools during the nineteenth century meant education improved, many children were still taught at home. The period was predominantly one of self-help and there was, as Giberne called it, "a household need" for easy science books like hers (*Among*, Preface). Scientific print had a tendency to overcomplicate its subject, and astronomy books were usually particularly technical, due to the use of mathematics and physics to explain celestial mechanics. The naturalist Reverend J. G. Wood called the technicality in Victorian science books "a veil of impenetrable language" that reversed "the real duty of an author, by puzzling people with easy matters, instead of rendering puzzling matters easy" (4).There was, as Giberne's promotion as a "pioneer" of books for beginners informs us, a gap in the market for truly basic instructive books written in a clear manner suitable for their level of readership. Giberne realised that there was a particular need for instructive books on astronomy which provided an introduction to the science, and

Figure 1 James Nasmyth, "Normal Lunar Crater", Woodburytype from *The Moon Considered as a Planet, a World, and a Satellite*, 1874.

could make the discoveries of the science more accessible to the beginner of any age, gender and class. Giberne recognised the difficulties of understanding many of the theories of astronomy in her *Radiant Suns*. This book expounded the theories of the construction and the motion of the heavens from the ancient Chaldeans to contemporary theories of spectrum analysis. Giberne explained that spectrum analysis was, "no easy subject to popularise", and her aim was "at least" to give "some general idea of its meaning and of its scope" that could be "gathered by the untrained reader" from her "pages" (x). As Giberne's obituary in *The Times* stated, the success of her books on science "showed her gift of divining a need where it existed" ("Miss" 12).

"Horrid Girl!"

Giberne's place as a bestselling writer of popular astronomy books is remarkable given that she found success in a science and genre that was male dominated. Whilst women were permitted to join the popular fervent fascination with astronomy that was part of the Victorian quest for knowledge, they were the subject of social and scientific restrictions on their involvement beyond the parlour. Victorian astronomical

writing, like the science of astronomy, was predominantly a male genre. There were a few popular astronomy books by women that circulated during the period including Mary Somerville's *The Mechanism of the Heavens* (1831), Rosina Zornlin's *What is a Comet, Papa?* (1835) and her *The Solar Eclipse* (1836), Frances Barbara Burton's *Astronomy Simplified* (1838), Mary Ward's *Telescope Teachings* (1859) and Agnes Clerke's *A Popular History of Astronomy during the Nineteenth Century* (1885). However, throughout the Victorian period the market was dominated by bestselling male authors such as Robert Stawell Ball, Joseph Norman Lockyer, John Pringle Nichol and Richard Anthony Proctor. This reflects the cultural attitudes to women's place in science during the Victorian period. Too much knowledge was considered unfeminine. An 1861 engraving in *Punch* titled "Horrid Girl!" attacked the woman who was too well informed, her knowledge scaring off suitors (Fig. 2). Enquiring whether she has seen Dion Boucicault's sensation play "The Colleen Bawn", a timid admirer receives the retort "Dear, Dear! Yes, of course" and she tells him she has

Figure 2 John Leech, "Horrid Girl!" from *Punch*, 1 June 1861.

Figure 3 John Leech, "So Fond of Astronomy that they are always on the Balcony, Looking for the Comet!" from *Punch*, 2 October 1858.

"been to the Crystal Palace", and read Paul B. Du Chaillu's "Gorilla book!"[5] Watching the heavens could even be deemed to put propriety at risk, as the man's hat covering the barrel of the telescope suggests in an 1858 *Punch* cartoon by John Leech titled, "So Fond of Astronomy, that they are always on the Balcony, Looking for the Comet" (Fig. 3). "A little smattering" of scientific knowledge was all that was considered needed by women. Writing to her brother Charles on 3 March 1833, Susan Darwin described how she could learn just enough knowledge of geology for her needs from cheap periodicals:

> I think Geology far the most interesting subject one can imagine & now I have found a very easy way of learning a little smattering of it. The penny Magazines give a few pages (which the most foolish person can understand) in every Number on the subject (*Darwin Correspondence*).

Women were often regarded by male scientists as overly sentimental and religious, and therefore intellectually inferior and incapable of conducting objective scientific research. Thomas Henry Huxley tried to stop women joining scientific institutions such as the Geological Society. "Five-sixths of women", wrote Huxley in an 1860 letter to the geologist Charles Lyell, would "stop in the doll stage of evolution" and cause "the degradation of every important pursuit with which they mix themselves – 'intrigues' in politics, and 'friponnes' in science" (356). Herbert Spencer in his *Education, Intellectual, Moral and Physical* (1861) and Darwin in his *The Descent of Man* (1871) also propounded the idea of male intellectual superiority.[6] In her *Sun, Moon, and Stars* Giberne reinforces, and yet exposes, this dominant ideology of male pre-eminence. In her family "called THE SOLAR SYSTEM" there is no female mother figure, it is the father figure of the Sun who nourishes the planets and is the giver of life to the solar system. It enables creation whilst the earth depicted as a female member of the solar system is according to Giberne "so far ... from being the head of the family, that she is not even one of the more important members. She is merely one of the little sisters, as it were" (3, original emphasis). If we consider nourishment in terms of education, Giberne appears to be making an astute comment on the cultural control of women's knowledge by men.

During the Victorian period, women's participation in scientific organizations such as the Royal Astronomical Society (RAS) was strictly regulated. Formed in 1820, from 1833 it allowed women to be honorary members, but there were only three in the nineteenth century – Caroline Herschel, Mary Somerville and Anne Sheepshanks. From 1838, women could hear papers discussed on mathematics and physics at the British Association for the Advancement of Science, but only four papers by women were read to this section in the nineteenth century.[7] The extent of the barring of women from astronomical science was recognised by the BAA which was set up to welcome those "who are, as in the case of ladies, practically excluded from becoming Fellows" of the RAS (Maunder 293). Practical experience of astronomy for women was limited to the role of active assistants to male astronomers; they were the "invisible technicians" of the astronomical community (Gates, *Kindred* 67). Women often took part in recording astronomical data for male family members. The most famous is Caroline Herschel, sister of the father of modern astronomy Sir William Herschel, who diligently kept nightly records of her brother's sweeps with his telescope. In 1828 she received a Gold medal from the Astronomical Society of London for "exertions probably unparalleled either in magnitude or importance in the annals of astronomical labour" (Herschel, *Memoir* 225). William Henry Fox Talbot's wife Constance watched the heavens and sent him letters recording her impressions of what she had observed. On 15 November 1866, Constance wrote to her husband describing how she and their children had waited-up until the early hours of the morning to observe a huge meteor shower: "It was about a quarter to one when I was quite finished & I thought I would just give one more look at the sky – When to my astonishment & delight I saw Meteors flying about in all parts, looking like small

rockets or like comets" (Talbot, *Correspondence*). Similar life-stories emerge with other women, such as the balloonist and botanist Gertrude Bacon who assisted her father in his astronomical pursuits. Her photograph of the 1900 solar corona deserved reference in Agnes Clerke's *Problems in Astrophysics* (1903), yet Bacon received more attention for her interest in botany, a ballooning accident and being the first female aircraft passenger. Indeed, Giberne recognised women had the ability for scientific observation without falling into the trap of frivolity they were accused of by Huxley. In her biography of the writer and poet Charlotte Maria Tucker, Giberne describes how Charlotte on watching a "mysterious sky-visitor", a meteor, "though non-scientific, was far too practical ... to indulge her powers of imagination" (*A Lady* 135).

"On the Wings of Imagination"

In general, women responded to social and literary critical constraints by keeping their scientific writing within accepted feminine literary traditions. Women had traditionally been seen as educators and women were permitted the role of children's writers, particularly as children's writing was considered a low status genre. In 1868 Mozley advised that the "ordinary domestic type of woman" was able to find ready employment writing for children, the uneducated and those with uncritical levels of taste who "require a literature adapted to an immature taste and judgement" ("Clever" 427; 426). However, with the widening recognition of the social importance of educating the young and lower-classes, children's writing climbed in status. Towards the end of the nineteenth century, the role of women as writers of scientific primers for children was diminishing. More male scientists like Proctor with his *Star Primer (*1885) and Ball with his *Star-land* (1889), were taking over the mantle of educators for the young and less-learned in society (Gates, *Kindred* 64). It was within this changing literary scientific scene and the gender constraints of Victorian scientific culture that Giberne wrote the majority of her science books, including those on astronomy.

Giberne, like other scientific women popularizers, negotiated a place in science through the characteristics of her writing. Allying their text with the science of botany, which was traditionally acceptable for women scientific writers, was one key to their acceptance (Lightman, *Popularizers* 95-100). Indeed, in contrast to other scientific societies, women were granted membership of the Botanical Society of London from 1836 onwards. Botany, as critics such as Gates and Shteir have shown had been labelled a 'feminine' science since the late eighteenth century, and was as D. E. Allen explains "able to masquerade as an elegant accomplishment" and as suitable for "the 'perfect lady' of a repressive Evangelicalism" (241). Throughout her *Radiant Suns* Giberne refers to the universe using botanic terms calling it the "great garden of the skies" (284). Her analogy of the universe as a "garden" is directly related to William Herschel's use of botanic nomenclature to describe the heavens. Herschel

had famously referred to the heavens as a "luxuriant garden, which contains the greatest variety of productions, in different flourishing beds" (2: 415).

The use of botany and her drawing on the work of a famous male astronomer, doubly reinforces the acceptability of Giberne's text and her position as a female scientific writer. Victorian women writers were the popularizers of male science; most scientific books by female writers were a re-telling of male research and theorizing (Gates, *Kindred* 3). As the women's rights activist Helen Hamilton Gardener explained in 1890, women were "welcome" to "reflect ready-made masculine opinions" (327). Arabella Buckley shrewdly denied any "pretensions to originality" in the preface to her *The Fairy-land of Science* (1879). She explained: "throughout the whole book I have availed myself freely of the leading popular works on science" (v). Giberne is keen not to establish herself as the sole authority in her astronomy books. When she writes about the nebular hypothesis Giberne is careful to draw on knowledge from accredited male scientists such as William Herschel and William Huggins. Whilst this reflects the lack of professional female involvement in astronomy, it also stresses the importance to women popularizers such as Giberne, of remaining within the gendered boundaries of scientific narrative discourse. Contemporary critical reviews castigated the female astronomical writer who dared promulgate her own thinking. A review of Agnes Clerke's *The System of the Heavens* (1890) in *Nature* magazine elaborates:

> In conclusion, we would again express our unqualified admiration of a good deal that the book contains, but we cannot help feeling that its value as a contribution to astronomical literature would have been greater if the author had confined herself to simply giving a trustworthy account of contemporary astronomical researches, and of the views held by competent thinkers (F. 172).

Giberne also explains the development of the universe in botanic terms in her *Radiant Suns*. She uses the analogy of the universe as a "Garden of the Skies" with everything it contains at different stages of development as seen through the eyes of a mayfly: "the mayfly, a creature of a day, comes into the garden and sees plants at various stages of growth" from "seeds just sprouting" to "aged dying trunks" (283). Giberne explains that equally in the universe we see "suns in apparently every variety of growth; incipient suns, half-formed suns, radiant suns, fading suns" (284). As the mayfly floats through the garden living for only one day it can see only a minute time span of the garden's development, just as Giberne reminds the reader, they and the astronomer can know very little of the development of the heavens as their life-span is also minute in comparison with that of the heavenly bodies. Giberne's botanic analogy of the heavens in a state of continual development with plants in different stages of growth in a garden is used as a means to make the nebular hypothesis, the most popular developmental theory of the solar system, more easily understandable to

her readers. Likewise, Giberne is also making it acceptable for a woman writer to discuss the theory in detail. The nebular hypothesis was a complicated theory, and was constructed by men. It was named by William Whewell in 1833 and drew together the ideas of Immanuel Kant, William Herschel and Pierre-Simon Laplace. The theory claimed stars, and thus planets and suns, were formed through the rotation and condensing of nebulous fluid spread in parts of the heavens into a small mass. As this mass contracted, rings of matter were thought to fly off into space and form a planet, the central condensed cloud forming a sun. The difficulty for Giberne is that due to the problem of time, as development takes place over time-spans beyond human capacity, the nebular hypothesis cannot be proved beyond doubt even though she regards it as "a fairly just notion of the general state of the case" (283). John Herschel, had expressed his belief in the "possibility of an imperceptible transition from the nebulous to the stellar state", but that "constant and diligent observation" over time rather than a single example would be needed for conclusive proof ("Account" 487-88; *Treatise* 407). Giberne's explanation for the improbability of proving the nebular hypothesis most strongly echoes that of Nichol in his *Views of the Architecture of the Heavens in a Series of Letters to a Lady* (1837): "There is a creature called an Ephemeron, whose life is confined to the veriest point in time, ─ in one short hour it dances out its existence in the sunbeam ... In relation to the nebulæ Man is only an Ephemeron". He questions "will man ever learn of the changes of the nebulæ!" (142-43).

The nebular hypothesis was also regarded as atheistic, seeming to eliminate the hand of the deity in the creation and operation of the universe. With its basis in Newtonian mechanics, development under the terms of the nebular hypothesis was the result of gravitational forces. Thus all was knowable, removing the element of the unknown that suggested to the imagination a divine First Cause. However, Nichol was to re-write the nebular hypothesis in a moral, "pulpit" version that divorced it from charges of atheism, and encouraged the readers of his *Views of the Architecture of the Heavens* to find evidence of an "Almighty Mind" operating the universe (Schaffer 201; 144). As Aileen Fyfe has shown evangelicals such as Thomas Milner publicly asserted that nebulous astronomy was not a threat to faith, as long as it was interpreted as showing development as evidence of God's creative power (19-20). In expressing the improbability of observing nebulous change, Giberne uses the uncertainty about the materialist nebular hypothesis to her advantage. It first of all aligns her analogy with that of the most famous male astronomer John Herschel and popular male astronomical writers such as Nichol. Secondly, it enables Giberne to maintain the sense of a "Divine and inscrutable Mystery" that she believes "will ever shine still beyond our most marvellous discoveries" (*Radiant* 11).

The other acceptable "point of entry" as a woman into the authorial world of popular astronomical writing was through religion (Sheffield 48). Astronomy, like natural history provided a way of worshiping God. By the time Giberne was writing on astronomy, the didactic tradition of using the natural world to warn children of the

risks of failing to follow a Christian life, had given way to incorporating a "capacity for warmth and laughter and imaginative enjoyment" (Butts 101). This is true of Giberne's astronomy texts where the emphasis is on invoking the reader's imagination as she encourages them in her *Sun, Moon, and Stars* "to look upward through Nature unto Nature's God", rather than teaching morality of thought and actions (xii). Giberne was a single woman and a devout Anglican whose family had strong connections to John Henry Newman and the Oxford Movement.[8] Thus she would have been very aware of the conservative social and religious roles expected of her as a woman and as a female scientific writer. Nothing a woman wrote should shake the foundations of religious faith. If they wrote for children they had a special responsibility for the religious wellbeing of their readers and in particular girls. Femininity was ensnared with religion in books and the periodical press. Print culture exercised considerable authority in defining Victorian "ideological parameters" of femininity (Morgan 1). Charlotte Yonge editor of the magazine the *Monthly Packet* which published articles by Giberne, advised readers to take care "Never" to "read anything that can at all unsettle [their] religious faith" ("Few" 241). According to Yonge, if a woman found her vocation "by pen or pencil" it was "only as a daughter of the Church" that she could "have her place, or be satisfied as to her vocation" (*Womankind* 7-8).

Acceptability and authority for the Victorian female scientific writer like Giberne went hand in hand with religious teaching. In her astronomy book for children *Sun, Moon, and Stars* she prefaces each chapter with biblical quotations, and in 1883 Giberne also published a religious contemplative book titled *Daily Evening Rest*. Through her writing and connections she comes across as a devout Christian who taught the possibility of knowing God through observing the heavens, and that astronomy was not incompatible with religious thought. In her *Radiant Suns*, Giberne explains how the evolutionary theory of the development of the universe is attuned to religious beliefs:

> The very words 'development' and 'evolution' have a sound of terror for many minds, as if they must of necessity mean an attack upon revealed religion. No doubt there are scientific men, here or there, as there are non-scientific men, who would use that or aught else if they could to shake the foundations of the faith. But in itself, intrinsically, development or evolution, call it which one may, is simply a scientific theory, designed to explain provisionally certain phenomena seen in nature, whether on our little world or in the wide regions of the skies (297).

Giberne is appealing to a readership struggling to equate these evolutionary theories with religious teaching. She argues that they are only "theories" and should not be used to "shake the foundations of the faith". In her *Radiant Suns*, Giberne explicitly

reconciles the nebular hypothesis and its idea of gradual development over millions of years with the biblical story of God's creation of the universe in six days. She suggests that "With the Eternal Father a thousand years are but as one 'day'; and a million years may be to Him as a very little thing" (296).

Giberne, like many female scientific popularizers such as Margaret Gatty and Buckley, also added to her acceptability and popularity by placing factual accounts within a fictional frame. Gatty made plants and animals talk in her set of moral tales for children *Parables from Nature* (1855-71), whilst Buckley adopted the fairy tale format in her *The Fairy-land of Science* to explain scientific facts about the sky, earth and other planets. Buckley advises the reader that it is her intention to "prove ... that science is full of beautiful pictures, of real poetry, and of wonder-working fairies" (2; 1). Giberne also adopts the idea of the fairy tale in her astronomy book *The Starry Skies* (1894) by opening with the classic fairy tale introduction "Once upon a time" (5; Lightman, *Popularizers* 429). As Lightman has noted, Victorian female scientific popularizers like Giberne, stuck to established feminine literary discursive models including the dialogue or conversational format (*Popularizers*). In her *Among the Stars*, Giberne uses the conversational style reminiscent of early nineteenth-century astronomy books such as Catherine Vale Whitwell's *An Astronomical Catechism* (1818). "The dialogue mode of instruction" wrote Whitwell, "possesses considerable advantages, in awakening the curiosity, and keeping up the attention, of the juvenile mind" (xi). The conversational or dialogue form had a long pedigree in children's scientific literature, the earliest example being Tom Telescope's *The Newtonian System of Philosophy Adapted to the Capacities of Young Gentlemen and Ladies* (1761).[9] One of the most popular nineteenth-century conversational science books that followed Tom Telescope's was the Reverend Jeremiah Joyce's *Scientific Dialogues*: *Of Astronomy* (1809), which was still being republished in 1852 in a combined volume with his other *Dialogues* on scientific subjects.

Gates and Shteir maintain that the dialogue form, a mainstay of the "narrative of natural theology" fell from grace in the 1860's. The form was heavily satirised for instance by Charles Dickens in his *Our Mutual Friend* (1864-65). John Ruskin found his dialogue book on mineralogy failed miserably when published in 1865 (Gates, *Kindred* 39-44; Gates and Shteir, "Introduction" 11-12). However, despite the dialogue form's loss of status, Giberne's *Among the Stars* has many similarities to earlier forms of scientific dialogue books - a narrative based on the exploration of the natural world, a question and answer format, a concern with scientific facts and explaining them (Myers 195; Lightman, *Popularizers* 430). Joyce and Whitwell's narratives are purely factual with examples from everyday life employed in their explanation. Whitwell's text tells only "popular truths from science" and Joyce aims to teach "facts" that enable the understanding of "the operations of nature" (viii; 11). Characteristic of these texts is a vocabulary and display of knowledge more geared to the miniature adult than child. Nevertheless, the authority of the author is explicit in the narrative form. As Greg Myers elaborates, "the didactic dialogue form requires

the ignorance of the listener, it requires and defines the authority of the teacher. The narrator not only knows all the answers to his questions, he knows all the questions" (185). For a woman science writer, such as Giberne, adopting this form instils a sense of authority on the writer, whose gender otherwise places her on the periphery of Victorian scientific culture.

However, the difference between earlier conversational science books and Giberne's *Among the Stars*, is the framework of imaginative fantasy that Giberne employs to convey the facts of astronomical science alongside the dialogue form. This is particularly notable in her use of the cosmic voyage theme. In the second half of the nineteenth century science books for children became more imaginative fusing fact with fiction. Heralded by the publication of Charles Kingsley's *The Water Babies* (1863) that merges science and fantasy, the following part of the century became referred to as the "Golden Age" of children's literature and was dominated by writers such as Lewis Carroll, George MacDonald and Robert Louis Stevenson (Greenleaf 185). Fantastical or imaginary journeys of which the cosmic voyage was a form were popular themes in literary and scientific texts. The literary tradition of the cosmic journey, and its endurance across historical periods, has been well rehearsed in scholarship on the subject by critics including Marjorie Nicolson, Mark R. Hillegas and Roger Lancelyn Green.[10] As they have shown cosmic voyage literature had its roots as far back as Antiquity, but reached outstanding prominence in the nineteenth century. The era saw the publication of Jules Verne's *From the Earth to the Moon* (1865) and his *Round the Moon* (1870), H. G. Wells' *The War of the Worlds* (1898) and his *The First Men in the Moon* (1901). It is also found in Victorian astronomy books and articles in periodicals. In 1872 Proctor published two cosmic journeys in the *Cornhill Magazine*, "A Voyage to the Sun" and "A Voyage to the Ringed Planet". Both of these articles were later printed in his book *The Borderland of Science* (1873), and Proctor also included an astral journey in his *The Expanse of Heaven* (1874). By including the theme of the imaginary cosmic journey in her *Sun, Moon, and Stars* and her *Among the Stars*, Giberne is aligning her writing with other bestselling popular scientific texts such as Proctor's and with the historical literary use of the theme. Giberne thus gives scientific and literary authority to her work in the eyes of the world of science and her readers.

Giberne employed the theme of the cosmic journey either by fully describing the imaginary voyage as in her *Among the Stars* and *Sun, Moon, and Stars*, or by suggesting her readers would do well to fancy themselves in Space so as they might experience the phenomenon she is describing more clearly. In her *Radiant Suns*, the condensing process of a developing nebula is described in detail to explain the theory of the nebular hypothesis. But so as the concept is made clearer to her readers she suggests to them that "with the particular nebula which we are picturing, you — should shut your eyes and get away into Space and *see* it!" (291). In her *Sun, Moon, and Stars* Giberne takes the reader on a journey of "two hundred and forty thousand miles" to the moon using "wings of imagination" (59). She reasons that:

> No line of rails has ever yet been laid from the earth to the moon, and no 'Flying Dutchman' has ever yet plied its way to and fro on that path through the heavens. Not on the wings of steam, but on the wings of imagination, we must rise aloft (60).

Giberne goes on to describe what can be seen from the surface of the moon and the striking features of the destination itself. She draws on established astronomical facts: the flame-like prominences on the sun, the black spots on its surface, how the sun lights the earth, the moon's atmosphere and its volcanic mountainous landscape (Fig. 4). But it is in her *Among the Stars*, that Giberne makes extended use of the cosmic journey. Here, she uses the theme of the cosmic voyage to describe the heavens to her readers through the eyes of a young boy called Ikon, who also flies through the solar system on "Wings of Imagination" (24). Giberne presents her readers with the experience of learning through the educational experience of her main protagonist, Ikon, who as a child is on the outside of scientific culture, just like the children and beginners her book is aimed towards. As well as disseminating astronomical knowledge, Giberne's text suggests that astronomy can be learnt from experts in the field – professional and amateur, male or female. Ikon is taught by a

Figure 4 "Lunar Landscape Sunset", from Agnes Giberne's *Sun, Moon, and Stars*, 1880.

German professor named Herr Lehrer and Fritz a practising amateur astronomer. The professor teaches Ikon the dry facts about the science including the distances of the planets from the sun, the distances of the bodies of the solar system from the earth and their relative sizes. He also takes Ikon to visit Fritz in his "summer-house" observatory where Ikon uses the telescope.[11] Herr Lehrer can only go part of the way in teaching Ikon astronomy – he hands Ikon over to Fritz who is a storyteller. Fritz tells Ikon a tale of a dream voyage to the moon, the planets and towards the sun by a boy called Eikōn. Giberne insinuates that more can be learnt from stories that invoke the reader's imagination than bare facts. The value of fiction to education had been recognised by Mozley in her article "On fiction as an educator" (1870). Mozley argued that "feeding and exciting the imagination" of children was essential to their "intellectual power" as adults (451).

The conveyance of knowledge from both Herr Lehrer and Fritz to Ikon is male to male. But Giberne also finds a role for women in this process through a girl

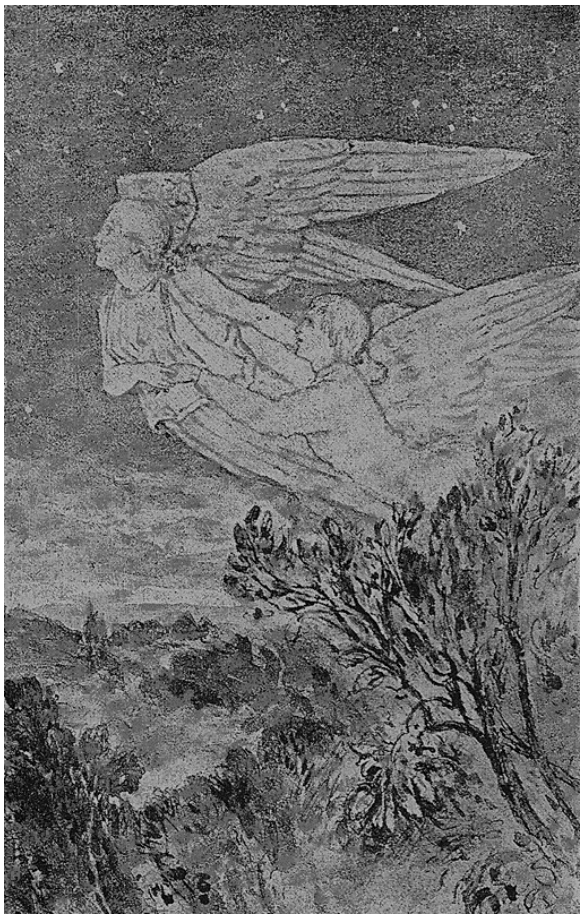

Figure 5 "A Flight to the Moon", from Agnes Giberne's *Among the Stars*, 1885.

appropriately called Stella, who accompanies Eikōn on the dream voyage through the solar system in the tale Ikon is told by Fritz (Fig. 5). At first she is a fictional character in Fritz's story, but later Ikon meets the real Stella who is Herr Lehrer's seventeen-year-old daughter. Both Stellas are well informed about the heavens, its stars, planetary bodies and celestial mechanics, and are able to explain the nature of its systems and their motions. At the end of Ikon's last meeting with Fritz, where they discuss the nature of an eclipse of the moon, Giberne writes "And Fritz vanished" raising the suggestion that Fritz is also a dream character. He is immediately replaced in Ikon's life by the adult Stella who Giberne portrays as more knowledgeable about planetary motion than Fritz: "'The sun is only one among multitudes of rushing stars'" explains Stella. Ikon eyes wide open retorts "'Mr. Fritz didn't say so ... When Eikōn saw the sun in his dream, it was quite still'" to which Stella replies "'And yet the sun does move'" (282).Through Stella, Giberne creates a female character that is a mirror image of herself. Stella can indulge in astronomy but only in a limited way by teaching a child and maintaining a feminine religious persona. The similarities to Giberne are remarkable. In her *This Wonderful Universe* Giberne describes how it was her father who inspired her interest in science and "who made Astronomy a living force in [her] imagination" (13). Like Giberne, Stella is also religious carrying a bible in her pocket from which she quotes Abraham and the Book of Job to Ikon (*Among* 275). Stella has also "learnt to love the stars" from her father, and the astronomical facts Stella has gained have come from male producers of knowledge rather than her own observations.

Like Stella, Giberne's authorial identity was as a disseminator of the facts of astronomical science learnt from male sources. This, together with her compliance with traditionally acceptable teaching and religious forms for women writers, no doubt contributed largely to her success. Encouraging her readers to learn about the heavens "on the Wings of Imagination", Giberne employed the literary and scientific narrative form of dialogue and the fictive theme of the cosmic journey (Giberne, *Among* 24). Astronomical writing sat precariously on the borderlines of what was considered a respectable occupation for Victorian ideal womanhood. Constrained by masculine science and patriachial norms, Giberne's texts and her social position as a bestselling scientific writer both inscribes and exposes this ideology. Giberne nevertheless achieved a position of agency and inclusion in scientific culture. Working within, yet beyond, the domestic sphere, Giberne negotiated a place as a bestselling author of popular astronomy books for children and beginners. By enclosing her astronomical writing within the maternal tradition of education and religious teaching, Giberne's femininity was not jeopardized, and the bestseller status of her astronomy books was ensured. Through her character Stella, Giberne comments on the role of women in scientific education: women have an important role as educators of astronomy and women, as well as men, can be the storytellers of astronomical science.

Notes

1 Accounts of Giberne's scientific texts are mostly confined to short entries in biographical dictionaries of women's writing, for example see Sage 271. Short accounts are also found in Greenleaf 185 and Thiel 7-8.

2 Many famous astronomers were also on the committee including the Earl of Rosse, William Huggins and E. Walter Maunder: Maunder 294.

3 Giberne discusses astronomical distances in these terms in her *Among the Stars*: 112-113. See also Macpherson's *A Century's Progress in Astronomy*: 50 for further reference to Giberne drawn from her *Radiant Suns*: 164.

4 Such an umbrella was exhibited at the Great Exhibition of 1851. It was made of "perforated material", which when opened and held up to the light, revealed spots of light that formed "the larger stars": "Planetariums" 307.

5 This is Paul B. Du Chaillu's *Explorations and Adventures in Equatorial Africa*. London: J. Murray, 1861.

6 For a full account see Gates, *Kindred Nature* 14-15.

7 These were Rosina Zornlin (1858), Dorothy Marshall (1895) and Hertha Ayrton (1895 and 1897): Kidwell 537. For a detailed account of the history of women in astronomy see Brück 2009.

8 Her paternal aunt Sarah Giberne was married to the Curate of Worton Walter Mayers, who as master of classics at Dr Nicholas' school in Ealing, had a formative influence on the young John Henry Newman. Her other paternal aunt was Maria Rosina Giberne a lifelong friend of, and campaigner for, John Henry Newman, who became a nun in a French convent. The Newman brothers, Francis and John Henry, taught for Mayers who educated boys at Worton Rectory in Oxfordshire to supplement his income. Agnes Giberne's father Charles was a pupil of Mayers: see Sugg 1996 and Sieveking 1909.

9 Attributed to the publisher John Newbery (1713-1767).

10 It was Nicolson who identified the theme and coined the term cosmic voyages in her *Voyages to the Moon* (1948).

11 Summer-house style observatories were popular in the Victorian period. Particularly favoured was the Revd. Edward Lyon Berthon's "Romsey" version

which could be built at a cost of £10 or £12, or £8, 10s without the transit room by any "village carpenter" (83-84). George Frederick Chambers also included the instructions in his *A Handbook of Descriptive and Practical Astronomy* (1890). Like Giberne, Chambers also lived in Eastbourne. In 1873 he built a "Romsey" type observatory that rotated on three cannon balls on the roof of his house, Northfield Grange, Eastbourne.

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